Amendments to the Claims:

This listing of claims replaces all prior versions, and listings, of claims in this application.

Claim 1 (Original): A pen stroke simulation device installed in a main system, the main system connecting to a handwriting pen by a signal transmission line, the handwriting pen comprising:

a pen tip;

a pen tip position sensor for capturing a main position coordinates of the pen tip on a handwriting tablet that generates a main position data;

a pressure sensor for sensing pressure by the pen tip on the handwriting tablet and generating a pressure value;

wherein the handwriting pen transfers the main position data and the pressure value through the signal transmission line to the main system;

the pen stroke simulation device comprising:

a pressure-radius transformation module for receiving the pressure value and transforming the pressure value to a radius value;

a positive vector generation module for receiving the main position data and generating a positive vector data according to the main position data;

a density location generation module connecting to the pressure-radius transformation module and the positive vector generation module for generating a plurality of density location data in the direction of the positive vector at the main positions based on the radius and the positive vector data to express a plurality of coordinates of the density locations; and a pen stroke generation module for drawing a main line according to the pen tip sliding across the main positions over time and drawing a plurality of density lines according to the density location data where each main position data corresponding to a plurality of the density location data.

Claim 2 (Original): A pen stroke simulation device as claimed in claim 1, wherein the pressure-radius transformation module employs a pressure-radius transformation equation to transform the pressure value Z into a radius value ϖ, the pressure-radius transformation equation being represented as:

$$\begin{cases} \varpi = f(z) = (Max\,\varpi) * \left(\dfrac{e^{z}-1}{e-1}\right) \\ where \\ f(0) = 0 \\ f(1) = Max\,\varpi \\ 0 \le Z \le 1 \end{cases} ;$$

where $Max\,\varpi$ being the maximum preset value of radius.

Claim 3 (Original): A pen stroke simulation device as claimed in claim 2, wherein the positive vector generation module first acquires an instantaneous direction of the pen tip on the main position coordinate according to the main position data, the equation being expressed as:

$$V_i = \frac{O_i - O_{i-1}}{|O_i - O_{i-1}|} ;$$

where V_i representing the instantaneous direction of the pen tip over time t_i, O_i representing the main position coordinates of the pen tip over time t_i, and O_{i-1} representing the main position coordinates of the pen tip over time t_{i-1};
if $V_i = (x, y)$, the positive vector data $N_i = (-y, x)$.

Claim 4 (Original): A pen stroke simulation device as claimed in claim 3, wherein the density location generation module employs a density location generation equation to generate a plurality of density location data, the equation being represented as:

$$b_{i,j} = O_i + \varpi(\frac{j}{n} - 1) \cdot N_i$$

where O_i representing the main position coordinates of the pen tip over the time t_i, ϖ representing the radius data, N_i representing the positive vector data, and n

representing a system preset value used for forming number of the density location data, and b_{ij} representing the j^{th} density location coordinates of the i^{th} main position coordinates;

where the stroke drawn by the handwriting pen, comprising m main position data, and each main position data corresponding to n density location data.

Claim 5 (Original): A pen stroke simulation device as claimed in claim 4, wherein the stroke generation module employs the stroke forming method to form the main line and a plurality of density lines, assuming the main line is formed by m main position coordinates and each main position coordinates corresponds to n density location coordinates, the method including:

computing tangent vectors T_i and T_{i+1} of the i^{th} and $(i+1)^{th}$ position coordinates, the equation being:

$$\begin{cases} T_{i+1} = a * (P_{i+1} - P_i) \\ a \in [0,1] \end{cases};$$

where P_{i+1} being the $(i+1)^{th}$ position coordinates, and P_i being the i^{th} position coordinates;

employing Blending functions to estimate the interpolating value between the i^{th} and $(i+1)^{th}$ position coordinates, the Blending functions being shown as follows:

$$\begin{cases} h_1(s) = 2s^3 - 3s^2 + 1 \\ h_2(s) = -2s^3 + 3s^2 \\ h_3(s) = s^3 - 2s^2 + s \\ h_4(s) = s^3 - s^2 \\ 0 \le s \le 1 \end{cases};$$

acquiring a Cardinal Splines Curve, and the equation being:

$\vec{P} = \vec{P}_i * h_1 + \vec{P}_{i+1} * h_2 + \vec{T}_i * h_3 + \vec{T}_{i+1} * h_4$; and

computing the medium coordinate position between the i^{th} and $(i+1)^{th}$ position coordinates, and linking the entire coordinate positions to form a smooth curve, the equation of the medium coordinate position being:

$$P = S * h * C \quad ;$$

where

$$S = \begin{bmatrix} s^3 \\ s^2 \\ s^1 \\ 1 \end{bmatrix} \qquad C = \begin{bmatrix} P_i \\ P_{i+1} \\ T_i \\ T_{i+1} \end{bmatrix} \qquad h = \begin{bmatrix} 2 & -2 & 1 & 1 \\ -3 & 3 & -2 & -1 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}.$$

Claim 6 (Original): A pen-stroke simulation device as claimed in claim 1, wherein the stroke generation module comprising:

a color parameters generation module, used to generate color parameters, relative to the main position data and the density location data through a random number generator.

Claim 7 (Original): A pen stroke simulation device as claimed in claim 6, wherein the color parameters generation module employs a color parameters generation equation to form the color parameters ρ_i, the equation being as follows:

$$\begin{cases} \rho_i = \rho_1 + \|rand()\| \% (\rho_2 - \rho_1 + 1) \\ where \\ \rho_1 \le \rho_i \le \rho_2 \\ \rho_1 , \; \rho_2 \in [0,255] \end{cases} \quad ;$$

where ρ_1 and ρ_2 being system preset values.

Claim 8 (Original): A pen stroke simulation device as claimed in claim 7, wherein the stroke generation module comprising:

a speed parameters generation module for generating speed parameters relative to the main position data and the density location data; and

a speed-color parameters generation module for generating a speed-color parameters according to the color parameter and speed parameter.

Claim 9 (Original): A pen stroke simulation device as claimed in claim 8, wherein the

speed parameters generation module employs a speed parameters generation equation to generate the speed parameter V, the equation being as follows:

$$V = f(v) = \left(\frac{v_{\max}^3 - 3v_{\max} v^2 + 2v^3}{v_{\max}^3} \right);$$

where v representing the instantaneous speed of the handwriting pen at the main position coordinates, and v_{max} representing a preset maximum speed; and the speed-color parameters generation module employing a speed-color parameters generation equation to generate the speed-color parameter $\rho_i^{'}$, the equation being as follows:

$$\rho_i^{'} = \rho_i * V.$$

Claim 10 (Original): A pen stroke simulation device as claimed in claim 1, wherein the stroke generation module comprising:

a shade parameters generation module for generating the shade parameters relative to the main position data and the density location data according to the pressure value.

Claim 11 (Original): A pen stroke simulation device as claimed in claim 10, wherein the main position data possesses the maximum value of the shade parameters, and the farther the distance from the main position coordinates, the smaller the shade parameter value of the density location data is.

Claim 12 (Original): A pen stroke simulation device as claimed in claim 11, wherein the shade parameters generation module employs a shade parameters generation equation to form shade parameter λ, the equation being as follows:

$$\lambda = (1 - \lambda_0)(1 - e^{-az}) + \lambda_0;$$

where a being a user defined constant, z being the pressure value, and λ_0 being a preset value of the shade parameters;

where the value of the pressure in the above equation exceeding a certain predefined value, the shade parameter approaching a constant.

Claim 13 (Original): A pen stroke simulation device as claimed in claim 1, wherein the stroke generation module comprising:

a dispersion parameters generation module generating a plurality of dispersion position data according to the main position data and the radius data ω for representing a plurality of dispersion positional coordinates where each main position data corresponding to a plurality of dispersion position data.

Claim 14 (Original): A pen stroke simulation device as claimed in claim 13, wherein the dispersion parameters generation module consists of a dispersion parameters *D*, which is used to decide the distance between every two of the dispersion position coordinate *q*, and employs a dispersion position generation equation to generate dispersion positional coordinates, such that the farther the distance from the main position coordinates, the shorter the distance between the dispersion positional coordinates is, the equation being as follows:

$$\frac{\partial q}{\partial t} = D\nabla^2 q \quad ;$$

where the equation being expanded by employing the finite difference method:

$$\Rightarrow \frac{q_{i+1} - q_{i-1}}{2t} = D \cdot (q_{i+1} - 2q_i + q_{i-1})$$
$$\Rightarrow q_{i+1} = q_{i-1} + 2Dt \cdot q_{i+1} - 4Dtq_i + 2Dtq_{i-1}$$
$$\Rightarrow q_{i+1} = \left(\frac{1}{1-2Dt}\right)(-4Dtq_i + (1+2Dt)q_{i-1})$$

Claim 15 (Original): A pen stroke simulation device as claimed in claim 13, wherein each dispersion position data corresponds to a dispersion color data, and the dispersion parameters generation module consists of a dispersion parameters D, to determine the variation in color between every two of the dispersion color data q, and to employ a dispersion color generation equation generating the dispersion color data,

such that the farther the dispersion position from the main position, the smaller the difference between the dispersion color data is, the equation being as follows:

$$\frac{\partial q}{\partial t} = D\nabla^2 q \quad ;$$

where the equation being expanded by employing the finite difference method:

$$\Rightarrow \frac{q_{i+1} - q_{i-1}}{2t} = D\cdot(q_{i+1} - 2q_i + q_{i-1})$$

$$\Rightarrow q_{i+1} = q_{i-1} + 2Dt\cdot q_{i+1} - 4Dtq_i + 2Dtq_{i-1}$$

$$\Rightarrow q_{i+1} = \left(\frac{1}{1-2Dt}\right)(-4Dtq_i + (1+2Dt)q_{i-1}) .$$

Claim 16 (Original): A pen stroke simulation device as claimed in claim 1, wherein the stroke generation module comprising:

a pause parameters generation module generating the pause parameters corresponding to the main position data and the density location data for determining whether the main position data and the density data will be seen.

Claim 17 (Original): A pen stroke simulation device as claimed in claim 16, wherein the pause parameters generation module consists of a table of preset values for the pause parameters, possessing a plurality of the pause parameters, for corresponding to the main position data and the density location data;

where the pause parameter being set to a first value, the corresponding position data being shown up, otherwise, a setting of a second value disabling the appearance of the corresponding position data;

the pause parameters d being represented as:

$d = dTable(i)$; where d ∈ [0, 1].

Claim 18 (Original): A pen stroke simulation device as claimed in claim 1, wherein the stroke generation module comprising:

a color parameters generation module for generating color parameters, relative to the main position data and the density location data through a random number generator, where the color parameters generation module employing a color parameters generation equation to form the color parameters ρ_i, the equation being as follows:

$$\begin{cases} \rho_i = \rho_1 + \|rand()\| \% (\rho_2 - \rho_1 + 1) \\ where \\ \rho_1 \le \rho_i \le \rho_2 \\ \rho_1 , \ \rho_2 \in [0,255] \end{cases},$$

where ρ_1 and ρ_2 being system preset values;

a speed parameters generation module, for generating speed parameters, relative to the main position data and the density location data, where the speed parameters generation module employing a speed parameters generation equation to generate the speed parameter V, the equation being as follows:

$$V = f(v) = \left(\frac{v_{\max}^3 - 3v_{\max} v^2 + 2v^3}{v_{\max}^3} \right),$$

where v representing the instantaneous speed of the handwriting pen at the main position coordinates, and v_{max} representing a preset maximum speed;

a shade parameters generation module, for generating the shade parameters, relative to the main position data and the density location data, according to the pressure value, where the main position data possessing the maximum value of the shade parameters, and the farther the distance from the main position coordinates, the smaller the shade parameter value of the density location data being, the shade parameters generation module employing a shade parameters generation equation to form shade parameter λ, the equation being as follows:

$$\lambda = (1 - \lambda_0)(1 - e^{-az}) + \lambda_0 ,$$

where a being a user defined constant, z being the pressure value, and λ_0 being a preset value of the shade parameters, once the value of the pressure in the above equation exceeding a certain predefined value, the shade parameter approaching a constant;

a pause parameters generation module, for generating the pause parameters corresponding to the main position data and the density location data, to determine whether the main position data and the density data being seen, where the pause parameters generation module consisting of a table of preset values for the pause parameters, possessing a plurality of the pause parameters, which corresponding to the main position data and the density location data, once a pause parameter being set to a first value, the corresponding position data being shown up, otherwise, a setting of a second value disabling the appearance, the pause parameters d being represented as:

$d = dTable(i)$, where d $\in$ [0, 1]; and

a stroke-color parameters generation module, used to generate the stroke-color parameters, according to color parameters ρ_i, rate parameters V, shade parameters λ, and pause parameters d, and the stroke-color parameters generation module employing a stroke-color parameters generation equation to compute the stroke-color parameters $C_{i,j}$, the equation being represented by:

$$C_{i,j} = \lambda * C_{i,j-1} * d * V;$$

where the stroke drawn by the handwriting pen, comprising m main position data, and each main position data corresponding to n density location data, and $C_{i,j}$ representing the stroke-color parameters to which the jth density location coordinates of the ith main position coordinates corresponding.

Claims 19. – 24 (Cancelled).